CLAIMS

We claim:

1. A multi-layer cable having a unsaturated outer layer, usable as a reinforcing element for a tire crown reinforcement, comprising a core (C0) of diameter d_0 surrounded by an intermediate layer (C1) of four or five wires (N = 4 or 5) of diameter d_1 wound together in a helix at a pitch p_1, this layer C1 itself being surrounded by an outer layer (C2) of P wires of diameter d_2 wound together in a helix at a pitch p_2, P being less by 1 to 3 than the maximum number P_{max} of wires which can be wound in one layer about the layer C1, this cable being characterised in that it has the following characteristics (d_0, d_1, d_2, p_1 and p_2 in mm):

- (i) $0.10 \leq d_0 < 0.50$;
- (ii) $0.25 \leq d_1 < 0.40$;
- (iii) $0.25 \leq d_2 < 0.40$;
- (iv) for N = 4: $0.40 < (d_0 / d_1) < 0.80$;

  for N = 5: $0.70 < (d_0 / d_1) < 1.10$;
- (v) $4.8\ \pi\ (d_0 + d_1) < p_1 < p_2 < 5.6\ \pi\ (d_0 + 2d_1 + d_2)$; and
- (vi) the wires of layers C1 and C2 are wound in the same direction of twist.

2. The cable according to Claim 1, of construction [1+N+P], wherein the core is formed by a single wire.

3. The cable according to Claim 2, selected from the group consisting of constructions [1+4+8], [1+4+9], [1+4+10], [1+5+9], [1+5+10] and [1+5+11].

4. The cable according to Claim 1, of construction [1+5+P].

5. The cable according to Claim 4, of construction [1+5+10].

6. The cable according to Claim 4, of construction [1+5+11].

7. The cable according to Claim 1, which satisfies the following relationship:

   - $0.25 \leq d_1 \leq 0.35$;
   - $0.25 \leq d_2 \leq 0.35$.

8. The cable according to Claim 1, which satisfies the following relationship:

   $0.15 \leq d_0 \leq 0.30$.

9. The cable according to Claim 8, characterised in that the steel is a carbon steel.

10. The cable according to Claim 1, characterised in that it is a steel cable.

11. The cable according to Claim 1, which satisfies the relationship:

    $5.0\ \pi\ (d_0 + d_1) < p_1 < p_2 < 5.0\ \pi\ (d_0 + 2d_1 + d_2)$.

12. The cable according to Claim 11, which satisfies the relationship:

    $5.3\ \pi\ (d_0 + d_1) < p_1 < p_2 < 4.7\ \pi\ (d_0 + 2d_1 + d_2)$.

13. The cable according to Claim 1, wherein the ratio (d_1/d_2) is between 1.05 and 1.30.

14. The cable according to Claim 13, wherein the ratio (d_1/d_2) is between 1.05 and 1.15.

15. A tire having a crown reinforcement which comprises a multi-layer cable having a unsaturated outer layer, comprising a core (C0) of diameter d_0 surrounded by an intermediate layer (C1) of four or five wires (N = 4 or 5) of diameter d_1 wound together in a helix at a pitch p_1, this layer C1 itself being surrounded by an outer layer (C2) of P wires of diameter d_2 wound together in a helix at a pitch p_2, P being less by 1 to 3 than the maximum number P_{max} of wires which can be wound in one layer about the layer C1, this cable having the following characteristics (d_0, d_1, d_2, p_1 and p_2 in mm):

- (i) $0.10 \leq d_0 < 0.50$;
- (ii) $0.25 \leq d_1 < 0.40$;
- (iii) $0.25 \leq d_2 < 0.40$;
- (iv) for N = 4: $0.40 < (d_0 / d_1) < 0.80$;

  for N = 5: $0.70 < (d_0 / d_1) < 1.10$;
- (v) $4.8\,\pi\,(d_0 + d_1) < p_1 < p_2 < 5.6\,\pi\,(d_0 + 2d_1 + d_2)$; and
- (vi) the wires of layers C1 and C2 are wound in the same direction of twist.

16. The tire according to Claim 15, wherein the multi-layer cable, of construction [1+N+P], has a core formed by a single wire.

17. The tire according to Claim 16, wherein the multi-layer cable is selected from among the group consisting of cables of the constructions [1+4+8], [1+4+9], [1+4+10], [1+5+9], [1+5+10] and [1+5+11].

18. The tire according to Claim 15, wherein the multi-layer cable has a construction [1+5+P].

19. The tire according to Claim 18, wherein the multi-layer cable has a construction [1+5+10].

20. The tire according to Claim 18, wherein the multi-layer cable has a construction [1+5+11].

21. The tire according to Claim 15, wherein the following relationships are satisfied :

- $0.25 \leq d_1 \leq 0.35$;
- $0.25 \leq d_2 \leq 0.35$.

22. The tire according to Claim 15, wherein the following relationship is satisfied :

$0.15 \leq d_0 \leq 0.30$.

23. The tire according to Claim 15, wherein the multi-layer cable is a steel cable.

24. The tire according to Claim 23, wherein the steel is a carbon steel.

25. The tire according to Claim 15, wherein the following relationship is satisfied :

$5.0\ \pi\ (d_0 + d_1) < p_1 < p_2 < 5.0\ \pi\ (d_0 + 2d_1 + d_2)$.

26. The tire according to Claim 25, wherein the following relationship is satisfied :

$5.3\ \pi\ (d_0 + d_1) < p_1 < p_2 < 4.7\ \pi\ (d_0 + 2d_1 + d_2)$.

27. The tire according to Claim 15, wherein the ratio (d_1/d_2) is between 1.05 and 1.30.

28. The tire according to Claim 27, wherein the ratio (d_1/d_2) is between 1.05 and 1.15.

29. A composite fabric usable as a crown reinforcement ply for a radial tire, comprising a matrix of rubber composition reinforced by a multi-layer cable having a unsaturated outer layer, comprising a core (C0) of diameter d_0 surrounded by an intermediate layer (C1) of four or five wires (N = 4 or 5) of diameter d_1 wound together in a helix at a pitch p_1, this layer C1 itself being surrounded by an outer layer (C2) of P wires of diameter d_2 wound together in a helix at a pitch p_2, P being less by 1 to 3 than the maximum number P_{max} of wires which can be wound in one layer about the layer C1, this cable having the following characteristics (d_0, d_1, d_2, p_1 and p_2 in mm):

- (i) $0.10 \leq d_0 < 0.50$;
- (ii) $0.25 \leq d_1 < 0.40$;
- (iii) $0.25 \leq d_2 < 0.40$;
- (iv) for N = 4: $0.40 < (d_0 / d_1) < 0.80$;

  for N = 5: $0.70 < (d_0 / d_1) < 1.10$;
- (v) $4.8\ \pi\ (d_0 + d_1) < p_1 < p_2 < 5.6\ \pi\ (d_0 + 2d_1 + d_2)$; and
- (vi) the wires of layers C1 and C2 are wound in the same direction of twist.

30. The fabric according to Claim 29, wherein the multi-layer cable, of construction [1+N+P], has a core formed by a single wire.

31. The fabric according to Claim 30, wherein the multi-layer cable is selected from among the group consisting of cables of the constructions [1+4+8], [1+4+9], [1+4+10], [1+5+9], [1+5+10] and [1+5+11].

32. The fabric according to Claim 30, wherein the multi-layer cable has a construction [1+5+P].

33. The fabric according to Claim 32, wherein the multi-layer cable has a construction [1+5+10].

34. The fabric according to Claim 32, wherein the multi-layer cable has a construction [1+5+11].

35. The fabric according to Claim 29, wherein the following relationships are satisfied :

- $0.25 \leq d_1 \leq 0.35$;
- $0.25 \leq d_2 \leq 0.35$.

36. The fabric according to Claim 29, wherein the following relationship is satisfied :

$0.15 \leq d_0 \leq 0.30$.

37. The fabric according to Claim 29, wherein the multi-layer cable is a steel cable.

38. The fabric according to Claim 37, wherein the steel is a carbon steel.

39. The fabric according to Claim 29, wherein the following relationship is satisfied :

$5.0\ \pi\ (d_0 + d_1) < p_1 < p_2 < 5.0\ \pi\ (d_0 + 2d_1 + d_2)$.

40. The fabric according to Claim 29, wherein the following relationship is satisfied :

$5.3\ \pi\ (d_0 + d_1) < p_1 < p_2 < 4.7\ \pi\ (d_0 + 2d_1 + d_2)$.

41. The fabric according to Claim 29, wherein the ratio (d_1/d_2) is between 1.05 and 1.30.

42. The fabric according to Claim 41, wherein the ratio (d_1/d_2) is between 1.05 and 1.15.

43. The fabric according to Claim 29, wherein the cable density is between 20 and 70 cables per dm of fabric.

44. The fabric according to Claim 43, wherein the cable density is between 30 and 60 cables per dm of fabric.

45. The fabric according to Claim 29, wherein the width ℓ of the bridge of rubber composition, between two adjacent cables, is between 0.5 and 2.0 mm.

46. The fabric according to Claim 45, wherein the width ℓ is between 0.8 and 1.6 mm.

47. The fabric according to Claim 29, wherein the rubber composition has, in the vulcanized state, a secant tensile modulus MA10 which is greater than 5 MPa.

48. The fabric according to Claim 47, wherein the rubber composition has, in the vulcanized state, a modulus MA10 which is between 5 and 20 MPa.

49. The fabric according to Claim 29, wherein the rubber is natural rubber.

50. The cable according to Claim 1, wherein said core comprises M wires, wherein M is equal to or greater than 2.